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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/735,771	12/16/2003	Akihisa Hongo	2003_1822A	4044
513 7590 01/11/2008 WENDEROTH, LIND & PONACK, L.L.P. 2033 K STREET N. W. SUITE 800 WASHINGTON, DC 20006-1021			EXAMINER MACARTHUR, SYLVIA	
			ART UNIT 1792	PAPER NUMBER
			MAIL DATE 01/11/2008	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/735,771	Applicant(s) HONGO ET AL.	
	Examiner Sylvia R. MacArthur	Art Unit 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 October 2007.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 34,35 and 38-41 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 34,35 and 38-41 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 May 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☒ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/18/2007 has been entered.

Response to Arguments

2. Applicant's arguments with respect to claims 34, 35, and 38-41 of 10/18/2007 have been considered but are unpersuasive. On page 5, paragraphs 1 and 3, applicant recites that the substrate processing apparatus uses a combination of bipolar phenomenon (using the electrolyte solution and the electrodes) and the microbubbles (using the ultrasonic transducer). On paragraph 1, 3rd sentence, the ultrasonic waves are explained as being applied to gas bubbles generated at the anodes to collapse or disperse the gas bubbles. Amended claim 34 now recites that the ultrasonic transducer is on the processing head facing the substrate. The claim further recites that the ultrasonic transducer is arranged next to the electrodes. Applicant argues on page 6, the first paragraph of the Remarks that the combined teachings of Lee et al (US 2005/0034999) and Brown et al (US 6,241,588) fails to teach to the ultrasonic transducer facing the substrate and in the positional relationship with the electrodes.

3. The examiner withdraws the rejection of Lee et al in view of Brown et al due to the amendment of the claims. The amendment necessitated the introduction of the prior art of Boyd et al (US 7,264,007) which teaches a proximity head with inlet and suction ports see Figs. 6D

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and 9A. In col.8 lines 28-35, Boyd et al teaches that the transducer is located within the proximity head 106a and/or 106b. Col. 15 lines 64-67 and claim 11 of Boyd et al teaches that the acoustic energy could also be ultrasonic energy. The motivation to provide an ultrasonic transducer is to enhance cleaning of the wafer by using the cavitations, that is bubbles that are generated and collapsed, see also col. 16 lines 22-40. Below the examiner will discuss how incorporating the ultrasonic transducer of Boyd et al into the processing head of Wang et al (WO 00/03426) provides a case of prima facie obvious of the present invention.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 34, 35, 38, and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al (WO 00/03426) in view of Boyd et al (US 7,264,007).

Wang teaches a method and apparatus for electropolishing metal interconnections of semiconductor devices.

Regarding claim 34: Wang et al teaches a substrate processing apparatus (electropolisher 50) comprising a substrate holder/chuck 29 (note the type of film on the substrate does not structurally limit the apparatus as the substrate 31 (wafer) worked upon is not part of the apparatus, see *In re Young*, 75 F. 2d 966, 25 USPQ 69 (CCPA 1935)), a processing head (polishing receptacle 100 with electrodes 1, 2, 3 which function as anodes and cathodes see page

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14 of Wang et al), a processing liquid supply section (fluid inlet 5,7,9), and a power source 13, 12, and 11, see the abstract and Figs. 20A and 20B. The abstract further teaches that an electrolyte 34 is delivered through the fluid inlets.

Wang et al fails to teach that ultrasonic transducer is on the processing head.

Boyd et al teaches a proximity (processing head) with inlet and suction ports see Figs. 6D and 9A similar to Wang et al. In col.8 lines 28-35, Boyd et al teaches that the transducer is located within the proximity/processing head 106a and/or 106b. Col. 15 lines 64-67 and claim 11 of Boyd et al teaches that the acoustic energy could also be ultrasonic energy. The motivation to provide an ultrasonic transducer is to enhance cleaning of the wafer by using the cavitations that is bubbles that are generated and collapsed, see also col. 16 lines 22-40. Further note that providing the transducer of Boyd et al in the processing head of Wang et al is would result in the transducer facing the substrate as the processing head faces the substrate see Fig. 20A,20B and the transducer would also be arranged next the anodes and cathodes as the inlet/outlet ports

Thus it would have been obvious at the time of the claimed invention to use the teachings of Boyd et al in the processing head of Wang et al as it shows that it is advantageous to provide an ultrasonic transducer on the processing head as the acoustic energy from the transducers creates cavitations that enhance the cleaning of the wafer.

Regarding claim 35: Pulse power supplies are discussed on page 16 lines 3-10 of Wang et al.

Regarding claim 38 Note Figs. 9A, 10, and 11 is arranged symmetrically about a center of the head. Neither Wang et al not Boyd et al teaches a plurality of transducers or that the shape of the transducers is generally triangular. The use of a plurality of ultrasonic transducers is interpreted as a matter of the duplication of parts. In re Harza, 274 F. 2d 669, 124 USPQ 378 (CCPA 1960)

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supports the conclusion that the mere duplication of parts has not patentable significance unless a new and unexpected result is produced. The motivation to provide additional transducers is to create zones of acoustic energy along the radius of the wafer and further provide uniform and enhanced cleaning. Regarding the shape of the transducers, the examiner deems obvious the shape of the transducer and deems that the shape is well within the skill of one designing the transducer. Further note that it was held by Dailey, 357 F. 2d 669, 149 USPQ 47 (CCPA 1966) that the shape of the transducer is a matter of choice which a person of ordinary skill in the Art would have found obvious absent persuasive evidence that the particular shape was significant, see also MPEP 2144.04d).

Regarding claim 41: The prior art of Wang et al teaches relative movement between the processing head and the substrate at all times of processing including during the application of pulse voltage, see Figs. 20A, B.

6. Claim 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al in view of Boyd et al, as applied in claims 34, 35, 38, and 41 above, and in further view of Talieh (WO 00/26443).

The teachings of Wang et al as modified with the ultrasonic transducer of Boyd et al were discussed above. The combination fails to teach specifically that the distance between the cathodes and anodes relative to the substrate is different.

Talieh teaches a substrate processing apparatus 10 comprising: a substrate holder (wafer head assembly 16) (note the type of film on the substrate does not structurally limit the apparatus as the substrate (wafer) worked upon is not part of the apparatus, see In re Young, 75 F. 2d 966, 25 USPQ 69 (CCPA 1935), a processing head (pad assembly 12 having anodes 30 and cathodes

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28, a processing liquid supply section, and a power source, see page 5 lines 13-25. The processing solution is an electrolyte, see the abstract of Talieh.

Talieh further teaches that the distance between the substrate and the anodes and the distance between the cathodes is different see Fig. 1B and 2. The motivation of designing the electrodes of Wang et al as taught by Talieh et al is that Talieh provides an alternative design of the processing head as either the anodes and cathodes would be designed as equidistant from the substrate or not. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to modify the processing head of Wang et al as modified by Boyd et al to have the distance between the anodes and the distance between the cathodes to be different.

7. Claim 39 is rejected under 35 U.S.C. 103(a) as being unpatentable over L over Wang et al in view of Boyd et al, as applied in claims 34, 35, 38, and 41 above, and in further view of Colgan et al (US 6,495,005).

The teachings of Wang et al as modified with the ultrasonic transducer of Boyd et al were discussed above. The combination fails to teach specifically that the supply ports correspond to the cathodes and the suction ports correspond to the anodes.

Colgan et al teaches an electroplating apparatus 302.

Colgan et al teaches a substrate processing apparatus comprising a substrate holder (note the type of film on the substrate does not structurally limit the apparatus as the substrate 12 (wafer) worked upon is not part of the apparatus, see *In re Young*, 75 F. 2d 966, 25 USPQ 69 (CCPA 1935)), a processing head with anodes 306 and cathodes 309, a processing liquid supply section (supply lines 350, 354, and 358), and a power source (this is inherently present in order from electricity to be generated though it is unshown or discussed).

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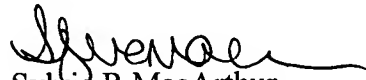
Colgan et al teaches supply and suction ports, see Figs. 2, 4, 5, and 13 and col. 6 lines 52-60. The motivation to modify the design of the supply ports and suction ports as taught by Colgan et al is that it is a matter of design choice and optimization barring a showing of criticality by applicant of the specific design, resulting from a rearrangement of parts. The mere rearrangement of parts which does not modify the operation of device is prima facie obvious. In re Japikse, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950). In re Kuhle, 526 F.2d 553, 188 USPQ 7 (CCPA 1975). Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to modify the processing head of Wang et al and Brown et al to have the supply ports correspond to the cathodes and the suction ports correspond to the anodes.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sylvia R. MacArthur whose telephone number is 571-272-1438. The examiner can normally be reached on M-Th during the hours of 8 a.m. and 4:30 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Sylvia R MacArthur
Primary Examiner
Art Unit 1792

January 6, 2008